

**APPARATUS FOR IMPROVING THE COLD STARTING  
CAPABILITY OF AN ELECTROCHEMICAL FUEL CELL**

**Abstract**

An electric power generation system has components that improve the cold start capability and freeze tolerance of a constituent fuel cell stack. The components cooperate to reduce the  
5 amount of water remaining within the passages of the stack. The system includes a purge system that is connectable to the oxidant supply, the fuel supply and/or the coolant passages upstream of the stack. When the stack is shut down, the  
10 stack is disconnected from an external circuit, and purge fluid is directed by the purge system through the stack before the stack falls below the freezing point of water. In systems where the fuel and/or oxidant streams are humidified prior  
15 to their introduction into the stack, a humidifier bypass system may be provided in place of the purge system. The humidifier bypass system directs reactant fluid to the stack in fluid isolation from the humidifier, so that the inlet  
20 reactant streams are unhumidified.